As used herein, the expression "ligand-gated ion-channel" means a transmembrane protein unit that acts as a gate for one or more charged species to move into or out of a cell. The state of the ligand-gated ion-channel is controlled primarily by the binding of small molecules (ligands) to either the protein unit itself or to a related area. Similarly, the expression "voltage-gated ion channel" refers to an ion channel that is controlled primarily by a voltage gradient, which gradient is generally similar to the range of electrical potentials observed in biological cells. The expression "voltage clamping" means a technique for measuring the flow of current through a cell membrane by holding its voltage constant. See, for example, "Electrophysiological Recordings from *Xenopus* Oocytes", Walter Stuhmer, *Methods in Enzymology*, Vol. 293, Academic Press (1998). The expression "test subject" means the object that is to be subjected to a test material. In clinical trials, humans are the test subjects. In the present invention, representative examples of test subjects include, but are not limited to, a biological cell, such as an oocyte expressing ion channels of interest, a section of cell membrane, an ion channel in an artificial membrane, or some other material permitting electrical control and measurement of ion channel activity. The expression "test material" means a substance, e. g. a compound, that is being tested for stimulatory, inhibitory or modulatory activity on the test subject. The term "modulator" means a test material that alters the response of a test subject. The term "agonist" means a substance that stimulates a receptor. The term "antagonist" means a compound that blocks the activity of an agonist. The expression "recovery time" means a refractory period needed by the test subject after a stimulus is applied thereto so that the test subject can respond fully to the next-applied stimulus. The term "applicator" means a fluid-handling device that aspirates test materials (e. g., compounds of interest) from vessels and dispenses them into recording stations. The flowcell includes a "channel" or "chamber" into which fluid perfuses and allows for the transient application of test material to the test subject. Such a fluid may be, for example, a physiological saline solution that

maintains viability of the test subject. The term "bath" refers to fluid surrounding and in contact with the test subject. The expression "perfusion bath" refers to fluid flowing continuously around the test subject with fresh fluid entering the bath and spent fluid exiting the bath at equal rates of flow. The expression "perfusion system" refers to the collection of devices providing a perfusion bath, such as the flowcell and its chambers or channels, tubing to instill fluid into the perfusion bath and remove fluid from the perfusion bath, and pumps or other sources of negative and positive pressure utilized to move fluid through the system. The expression "dead volume" means the volume contained within a fluid-handling component (e. g., tube or applicator) that is not utilized during an operation. In the case of this invention, the dead volume is the volume of a test material, e. g., a compound, that is aspirated from a storage vessel but not eventually dispensed into the recording station. Alternatively, "dead volume" can refer to a volume of fluid that is not exchanged by flow of the fluid, such as, for example, water trapped in a pocket at the edge of a stream. In this invention, the alternative meaning of dead volume is the area of the fluid region of the recording station that is not washed quickly by the perfusion bath.

Please replace the paragraph beginning at page 14, line 15, with the following:

The most direct approach for introducing a test material, e. g. a chemical compound, into the recording station 16 would involve the steps of aspirating the test material from a reagent vessel 36 and introducing the aspirated test material to the channel 42 of the flowcell 40. However, in the preferred embodiment, care must be taken so that the test subject in the channel 42 is not exposed to the test material before the intended time of application. In addition, in the preferred embodiment, the applicator 32 should be in contact with the fluid in the channel 42 prior to commencing application of the test material in order to minimize mechanical disturbance of the

perfusion bath. Essentially, test material at the end 32a of the applicator 32, both in the interior of the applicator 32 and on the exterior surface of the applicator 32, will spread throughout the channel 42 in the flowcell 40 once the applicator 32 touches the fluid in the channel 42 (see FIGS. 7A, 7B, and 7C, where the test material is represented by diagonal lines running from the upper right to the lower left). This spread of the test material would be undesirable, because the test subject T would be exposed to the test material prior to the intended time. However, this spread of the test material can be prevented by first creating a safety gap 62 at the end 32a of the applicator 32 and then washing the interior of the applicator 32 and the exterior surface of the applicator 32 prior to application of the test material (see FIGS. 7D, 7E, 7F, 7G, and 7H, where the test material is represented by diagonal lines running from the upper right to the lower left). During this washing procedure, the applicator 32 is positioned and held in the wash station 22 for an interval of time sufficient to complete the intended wash operation. During the application operation, the applicator 32 is positioned and held in the channel 42 of the flowcell 40 for an arbitrary interval of time prior to initiating the flow of test material. In this manner, accurate baseline data can be acquired before the test material is introduced into the channel 42 of the flowcell 40 and subsequently to the test subject T.